This is a contribution from *Sequential Voicing in Japanese. Papers from the NINJAL Rendaku Project.*
Edited by Timothy J. Vance and Mark Irwin.

This electronic file may not be altered in any way. The author(s) of this article is/are permitted to use this PDF file to generate printed copies to be used by way of offprints, for their personal use only. Permission is granted by the publishers to post this file on a closed server which is accessible to members (students and staff) only of the author's/s’ institute, it is not permitted to post this PDF on the open internet. For any other use of this material prior written permission should be obtained from the publishers or through the Copyright Clearance Center (for USA: www.copyright.com). Please contact rights@benjamins.nl or consult our website: www.benjamins.com

Tables of Contents, abstracts and guidelines are available at www.benjamins.com
The purpose of this paper is to document rendaku-like devices in languages other than Japanese and to cast a comparative and typological eye on the phenomena involved. Two cases are extensively discussed: Korean sai-sios, whose exponents are tensification, nasalization, or t-insertion, and Basque lotura, whose exponents are devoicing, affrication, or t-insertion. The paper also reviews seven other unrelated languages which possess similar compounding devices: Slave, Movima, Kanamari, Malagasy, Nivkh, Nêlêmwa, and Malayalam. It is argued that rendaku-like elements should be recognized as featural linking elements (FLE), a subtype of linking elements, whose featural nature induces a number of specific properties. To conclude, the paper addresses some issues specific to Japanese rendaku which can arguably receive new insights thanks to the cross-linguistic and typological investigation.

11.1 Introduction

Vance (2015a: 436) writes that new research is unlikely to pay off for a phenomenon as well studied as rendaku. Indeed, there is probably nothing truly original to be discovered about rendaku itself any more, studied from a purely internal point of view. But the same can definitely not be claimed about rendaku in a cross-linguistic perspective. It is no exaggeration to observe that rendaku has been totally understudied in its typological and cross-linguistic dimensions. For instance, the annotated bibliography by Mark Irwin at the end of this book contains about 240 references on rendaku, but only seven of them are concerned with the comparison of rendaku with a similar device occurring outside of the Japonic family. Five of these papers deal with Korean (Shioda 1987; Cook 1991; Takayama 1999; Labrune 1999; I Munsang 2004), one with Dutch (van de Weijer 2003), and one with Basque (Labrune 2014). Nevertheless, the study of rendaku-like elements in languages other than Japanese appears to be a promising field of research, likely to deepen our understanding of a number of aspects of the Japanese facts themselves and also to contribute to new
discoveries in the domain of word formation universals (or, more realistically, of universal tendencies) within the fields of morphology and morphophonology.

A question one may want to ask is why rendaku has been so little studied from a cross-linguistic perspective. Among the plausible reasons, one should first observe that the label *rendaku* itself is totally opaque from a non-Japanese point of view, while at the same time extremely specific in its meaning. Taken at face value, linguists engaged in the search for phenomena similar to rendaku in other languages ought to be looking for a voicing alternation, that is, for a kind of “sequential voicing,” since this is how rendaku is generally defined (Vance: §1.2). Such a search would of course neglect anything which involves a process other than voicing. Second, Japanese linguists working on cross-linguistic comparison between Japanese and other languages are generally more interested in English than in any other language. Since English, however, does not possess anything close to a rendaku-like element, generalizing from the English case (a tendency which is unfortunately not infrequent) makes it all too easy to jump to the conclusion that rendaku is a Japanese-specific device. Another caveat is that rendaku studies have been mainly conducted by phonologists, but since rendaku is actually first and foremost a morphological process in essence, similar phenomena in other languages are more likely to be addressed in papers and conferences dealing with morphology (as well as syntax and semantics) rather than with phonology, and may therefore escape the attention of many rendaku specialists. Furthermore, as the number of studies published on rendaku itself demonstrates, and as anyone who has worked on the topic knows, rendaku (and hence, rendaku-like phenomena) is an extremely complex phenomenon, standing at the interface between phonology and morphology but also involving semantics, syntax, and a number of other areas. To engage in a comparative approach will inevitably prove to be a difficult task.

Yet, and this makes for another reason, it is fair to say that, on a more general scale, the field of compounding across languages has actually received very little attention from a contrastive or typological point of view. Those studies conducted have generally investigated word composition by way of comparison between closely related languages, and nearly always between languages of the Indo-European family. As Štekauer et al. (2012: 1) put it, “[t]he most significant achievements in the study of morphological typology and morphological universals tend to rely on cross-linguistic research into inflectional categories and properties and on their description, but not on derivation.” (For Štekauer et al., “derivation” is a synonym for “word-formation”). General morphology books or papers dealing with the cross-linguistic description of compounding devices hardly ever contain any specific mention of rendaku-like elements. Even Japanese rendaku itself is rarely mentioned, in spite of the abundant research which has
been conducted on it inside and outside Japan. What one may find are occasional and brief mentions of rendaku or rendaku-like word compounding devices, but this is always done on an anecdotal, language-specific basis. Such compounding devices are rarely presented as belonging to a “type,” that is, as different tokens or instances of a general pattern. In fact, formal word-compounding processes in general have been rather neglected within the domain of general morphological research.1

The aim of this paper is to document the grammar of rendaku-like phenomena in languages other than Japanese and to assert the existence of rendaku-like devices as well as their relevance for cross-linguistic and typological research. One of the claims that will be put forth is that rendaku-like markers are not rare or anecdotal in the languages of the world, and that as such, they should be recognized in their own right, alongside other types of compound markers such as the German Fugenlaut, the linking vowel of Greek, and the linking η of Tagalog, to name just a few, or purely prosodic devices such as tone and accent. It is also expected that the cross-linguistic perspective will, in turn, refresh our understanding of the Japanese data themselves and bring forth new insights into rendaku. The empirical focus of the present paper will be on two languages, Korean and Basque, which will be described in detail, but a number of other languages will also be considered.

This paper is organized as follows. Section 2 (“Defining Rendaku”) proposes a characterization of rendaku as a “featural linking element” alongside other better known types of linking elements. Section 3 (“Korean”) and Section 4 (“Basque”) provide internal descriptions of the Korean sai-sios and the Basque lotura phenomena, which exhibit rendaku-like behavior. Section 5 is an excursus on some intriguing properties of voiced obstruents in Japanese, tense consonants in Korean, and voiceless and affricate consonants in Basque. In Section 6 (“Other Languages with FLEs”) I briefly review and discuss seven languages which, I argue, might possess FLEs similar to rendaku: Slave, Movima, Kanamari, Malagasy, Nivkh, Nêlêmwa, and Malayalam. Section 7 aims to provide a synthesis of the essence and attributes of FLEs and of their formal properties. I identify eight such properties which are arguably characteristic of FLEs cross-linguistically. This section also addresses a number of remaining questions and future research issues. As a conclusion to this paper, Section 8 (“Have we Learned Anything about Japanese Rendaku?”) returns to Japanese in order to re-examine some rendaku issues in the new light of the cross-linguistic perspective.

1. The volume published in 2012 by Štekauer et al. (mentioned just above) constitutes a recent exception to this neglect.
11.2 Defining rendaku

11.2.1 Rendaku as a linking element

According to Anderson (1985:46), when classifying compounds, one can refer either to their formal structure or to the semantic relations between their components. The formal structure can be characterized in terms of the elements which are compounded, the manner in which they are joined, or the category of the resulting compound. It is obviously the “manner” in which the two elements of the compound are joined that constitutes the most salient defining property of rendaku, generally described in the literature as the process whereby an initial voiceless obstruent voices at the beginning of the non-initial element of a compound (Vance §1.2). Rendaku can thus be defined as the insertion of phonological material at the juncture between the two constituents of a compound word in order to mark composition.

Under this approach, the first label that comes to mind when we apprehend rendaku is that of linking element.² Other terms which have been commonly used in the literature to refer to such elements are “linking morpheme,” “interfix,” “intermorph,” “compound formative,” “compound marker,” “confix,” “linker,” “ligature,” “stem joiner,” and “ligateme.” Kürschner and Szczepaniak (2013a) define linking elements as “meaningless phonological or graphematic material that appear at the boundary between the immediate constituents of word-formation products.” They add that linking elements “are considered to be borderline-cases of morphology …, since they resemble morphological segments, but are (at least prototypically) meaningless.” Lieber and Štekauer (2009:13) define linking elements as meaningless extensions that occur between the first and second elements of compounds. For Bussman (1996), they are morphological elements, usually single vowels or consonants, that occur between the two immediate constituents and thereby create compounds and derivations.

Linking elements have been especially well-documented and analyzed in the context of Germanic languages. In German, the linking element is known as Fugenlaut or Fugenelement in the native linguistic tradition. It consists principally

---

² Rendaku was characterized as a “linking morpheme” by Ito and Mester (1986:57), who state that “rendaku is essentially a morphological process introducing a linking morpheme in a certain morphological context.” Ito and Mester (2003a:85) emphasize the fact that rendaku belongs to a “cross-linguistically very common type of compound morphology.” They also provide a list of languages which seem to use linking devices similar to rendaku, but without entering into the details of each language. Their list is based on a list published by Krott (1999).
of the marks -(e)s-, -(e)n-, -e- (and other less common ones), which are inserted between the two elements of a compound, as in the examples in (1), taken from Kürschner and Szczepaniak (2013a, 2013b). (The German examples are given in Standard German orthography, except for the hyphen signaling insertion of linking elements.)

(1) a. Sicherheit + Bedenken → Sicherheit-s-bedenken
   ‘security’ + ‘concern’ → ‘security concern’
   b. Affe + Hand → Affe-n-hand
      ‘ape’ + ‘hand’ → ‘hand of an ape’
   c. Tag + Werk → Tag-e-werk
      ‘day’ + ‘work’ → ‘daily task’

Other rather well-documented cases of linking elements are the linking vowels of Greek or of Russian (and other Slavic languages), and of Persian (the so-called Ezafe element). In Russian, for instance, we have the following examples, taken from Ralli (2008).

(2) a. /hleb/ + /zavod/ → /hleb-o-zavod/ ‘bread’ + ‘factory’ → ‘bread factory’
   b. /neft’/ + /pravod/ → /neft’-e-pravod/ ‘oil’ + ‘conductor’ → ‘oil pipeline’

Outside the Indo-European family, the phenomenon is far less well documented, but linking elements are occasionally reported. For instance, the volume by Štekauer et al. (2012:77–79) contains a sub-section entitled “Formal Characteristics of Compounds with a Linking Element,” which provides a list of 13 languages with a linking element, 11 of these languages belonging to a family other than Indo-European. However, Japanese rendaku is not included on the list, and it is not cited as a case of word compounding involving a linking element (although it is mentioned elsewhere in the volume as an illustration of a “stem-stem compound” in which “at least one stem is phonologically modified” (Štekauer et al. 2012:335, n.9). Actually, for Štekauer et al. (2012:79), “linking elements” are “mainly single-phoneme elements, either vowels or consonants.” The notion of linking elements as (usually) single-phoneme elements, either a vowel or a consonant, is also explicitly mentioned by Bussman (1996), as cited above, and it is also implicit in other descriptions, since the examples provided generally all involve linking elements that are at least one-phoneme long (see also Aikhenvald 2007). Obviously, rendaku does not meet this criterion, which probably explains why it is never mentioned as a case of a “linking element” in the general morphological literature. However, we do glean from the definitions and examples just reviewed that, like linking elements, rendaku is (1) phonological material that appears between the two constituents of a compound, and (2) meaningless, in the sense that it is deprived of referential value.
11.2.2 Rendaku as a featural affix

Another relevant notion for the categorization of rendaku is that of a “featural affix,” as defined for instance by Akinlabi, who says that “[F]eatural affixes are phonological features that function as grammatical morphemes” (Akinlabi 2011) and that they are “always realized as part of some other segment or segments of the stem” (Akinlabi 1996). The most commonly found cases are tonal, like the following examples from the Ekpheli dialect of Etsako (Akinlabi 1996), a two-tone language. Akinlabi proposes that the Etsako associative High tone, which marks a modifier–modified construction, is a featural affix which is suffixed to the head noun and replaces all Low tones until it reaches a High tone in a right-to-left manner. For lack of space, I provide in (3) only examples with the same second element, meaning ‘father’, which is LL, because the tones of the second element remain constant. Thus, ‘father’ can be replaced by a noun with any of the three possible tonal patterns, LH, HL, or HH.

(3) a. LL → HH /ámɛ́/ + /èθà/ → /ámɛ́+èθà/ ‘water’ + ‘father’ → ‘father’s water’
b. LH → LH /ɔ̀tɛ́/ + /èθà/ → /ɔ̀tɛ́+èθà/ ‘cricket’ + ‘father’ → ‘father’s cricket’
c. HL → HH /únɔ́/ + /èθà/ → /únɔ́+èθà/ ‘mouth’ + ‘father’ → ‘father’s mouth’
d. HH → HH /ódzí́/ + /èθà/ → /ódzí́+èθà/ ‘crab’ + ‘father’ → ‘father’s crab’

Akinlabi (1996, 2011) also reports several cases of non-tonal features functioning as grammatical morphemes. He mentions ten such examples, such as Chaha’s 3rd masculine object indicated by labialization, Nuer’s tense/aspect distinctions with the features [continuant] and [voice], Terena’s 1st-person possessive marker realized as [nasal], and so forth. Rendaku is not mentioned as a case of featural affix (although palatalization in Japanese mimetic words is), but it obviously corresponds to the description given above of “a phonological feature that functions as a grammatical element and is realized as part of some other segment,” if we accept the idea that rendaku is a “grammatical morpheme.”

In a recent work, Trommer (2014) defines featural affixes as:

… subsegmental and suprasegmental affixes which surface (partially or completely) as (a) phonological feature(s) of (a) segment(s) of the base word. In procedural terms, this refers to any every morphological construction which involves the partial phonological modification of base segments. Featural affixation is attested for virtually all phonological dimensions (prosodic length, suprasegmental tone, and primary/secondary features of vowels and consonants).

Considering the examples that are given by Akinlabi and Trommer, it appears that what they seem to have in mind are mostly grammatical flexional affixes which express syntactic functions or grammatical categories such as person, tense, aspect, gender, number (such as 3rd person in Zoque) and so forth, or semantic classes.
(as in Fula with the feature [continuant]). Formally, therefore, rendaku fits into the category of featural affixes, but less so functionally, since it does not express a grammatical category or a semantic class. It is interesting to note that Trommer includes “prosodic length” on his list of possible so-called featural affixes. Indeed, as we shall see, featural elements can sometimes be realized as prosodic length. Korean, for instance, possesses a linking element which surfaces as a feature, as a full segment, or as the gemination of a consonant.

Featural affixes can be conceived of as subsegments, a.k.a. floating features, in the sense of Zoll (1998). Subsegments are phonological elements which are realized as part of other segments, sharing the same timing slot with one or more of the segments of the base, and that are invisible to the syllable in some way. Zoll (1998: 18) states that some featural affixes can appear as either a dependent feature or as a free-standing segment, that is, they may have varying occurrence as a feature or a segment within the same language. As will be seen in the rest of this paper, it is not uncommon for rendaku-like elements to possess a full segmental realization under some special conditions, as the Korean and Basque cases will illustrate.

Another related notion is that of mutation, a process which arguably occurs in the Celtic languages, in Fula, and in Nivkh, for instance. But mutation generally involves more than a binary opposition, that is, the element undergoing the mutation exhibits more than two alternants. However, some authors, for instance Wolf (2007), use the term “mutation” to refer to “a set of instances in which some morpheme manifests itself, in whole or in part, as a change to the segmental features, tone or moraic pattern of some other morpheme.” Under this approach, rendaku could be regarded as an instance of mutation.

Finally, rendaku could also be characterized as a specific kind of sandhi, in the Bloomfieldian sense of the term: a phonological modification that words and morphemes undergo when they are combined together. However, sandhi is generally not conceived as the manifestation of a morphological marker, but rather as the result of phonetic assimilation. Thus, rendaku cannot be considered as a typical case of sandhi, at least not according to the approach followed in this paper, where rendaku is viewed as resulting from the addition of a morphological element inserted at the boundary between two constituents of a compound word.

11.2.3 Rendaku as a featural linking element

Combining the definitions of linking element, subsegment, featural affix, and mutation, one arrives at the concept of a featural linking element, one which I shall use throughout this study. The working definition of a featural linking element (hereafter FLE) that I propose and adopt throughout this paper is as follows.
A featural linking element is a morphological element that occurs at the boundary between two constituents of a compound, which lacks referential value, and whose function is to signal composition. It is inherently defective, and prototypically involves a consonant alternation that can be characterized phonologically as one or more floating feature(s). In some less prototypical cases it involves a modification in segmental quantity (consonant gemination) or the realization of a full segment resulting from default filling.

With this definition in mind, let us now proceed to the investigation of rendaku-like FLEs in languages other than Japanese.

11.3 Korean

Korean (either an Altaic language or an isolate; the question is still controversial) possesses an FLE whose properties and behavior very closely resemble those of rendaku. This element is known as \textit{sai-sios} or \textit{sai-soli} in the native tradition, hereafter \textit{sai-sios} (without italization).

Turning first to an overview of Korean phonology, I introduce only issues relevant to the matters discussed in the present paper. The phonemic system of Korean contains the following consonants: /p pʰ t tʰ c cʰ k kʰ s sʰ h m n ŋ l/. Korean has a well-known three-way distinction between lenis (plain, lax) /p t c k s/, fortis (tense, glottalized) /pʰ tʰ cʰ kʰ sʰ/ and aspirated consonants /pʰ tʰ cʰ kʰ sʰ/. Note that the coronal fricatives only appears as lenis or fortis. Fortis consonants

3. The facts discussed in the present paper are not intended as a contribution to the controversial debate on the relationship between the Japanese and Korean languages. It might be that rendaku and sai-sios are cognate processes and that they provide evidence for a Korean–Japanese genetic relationship (this view is actually defended by Cook 1991), but it could also be that they are not, especially if we take into consideration the fact that devices similar to rendaku and sai-sios are not infrequent in languages of the world belonging to different genetic families. Even if Korean and Japanese are genetically related, it is also perfectly conceivable that rendaku and sai-sios developed independently.

4. The transcription of the Korean examples employs the most representative IPA graph for each letter of the Korean alphabet. This transcription method is also adopted for the romanization of Korean author names and publication titles cited throughout this paper, with the exception of those linguists’ names whose romanization is already quasi-standardized under a different transcription, e.g., Lee Ki-mun 李基文 (rather than I Ki-mun). Examples cited from other publications have been adapted to the present system. Finally, in the examples, Chinese characters are provided for words which belong to the Sino-Korean stratum.
are sometimes assumed to be geminate versions of the corresponding lenis ones, a view supported by the Korean writing system.

Lexical or post-lexical phonetic or phonological processes which are relevant for the understanding of the data discussed below are the following. (a) Lenis plosives are realized as voiceless word-initially. (b) However, lenis plosives are regularly voiced between vowels and sonorants. (c) In syllable-final position, obstruents are unreleased and occur as [pʰ] [tʰ] [kʰ], while the affricate and fricative coronals /c/, /ch/, /s/, and /s'/ undergo reduction to an unreleased [tʰ]. (d) A lenis consonant automatically undergoes fortition (=tensing) following an obstruent. This last process, known as post-obstruent tensing (hereafter POT) in Korean phonology, is a systematic and exceptionless post-lexical combinatory phonetic phenomenon. POT will be of particular relevance for the analysis of the data discussed in this chapter. The processes in (a)–(d) can be expressed by the rules in (5).

(5) a. \([-\text{cont}, -\text{son}, -\text{tense}] \rightarrow [-\text{voi}] / \# -\]
   /pi/ → [pi] ‘rain’
   /kul/ → [kul] ‘oyster’

b. \([-\text{cont}, -\text{son}, -\text{tense}] \rightarrow [+\text{voi}] / [+\text{voi}] - [+\text{voi}]\]
   /kul/ ‘oyster’ + /kwa/ ‘and’ → [kulgwâ] ‘oyster and’

c. \([-\text{cont}, -\text{son}] \rightarrow [-\text{released}] / - \)
   /pap/ → [papʰ]
   /pap’rice’ + /to/ ‘also’ → [pap’tô] ‘rice also’

d. \([-\text{cont}, -\text{son}, -\text{asp}] \rightarrow [+\text{tense}] / [-\text{son}] -
   /pap’rice’ + /to/ ‘also’ → [pap’tô] ‘rice also’
   /pap’rice’ + /kaps/ ‘price’ → [pap’kapʰ] ‘rice price’
   /os/ ‘cloth’ + /to/ ‘also’ → [ot’tô] ‘cloth also’

As we shall see below, POT maintains a close and intricate relationship with sai-sios because in some cases sai-sios is realized as the tensing of an obstruent. However, all cases of tensing occurring at word or morpheme boundaries do not necessarily correspond to the insertion of sai-sios, and moreover, sai-sios is also realized by means other than a tense consonant.

Sai-sios (사이시옷) literally means ‘intermediate s’. This term stems from the orthographic practice of inserting a graphic s (i.e., a sios, the name of the letter 〈ㅅ〉 representing the /s/ sound in the Korean alphabet) between the two elements of a compound when the first element ends in a vowel.5 When the first element ends in

---

5. Most of the examples that will be discussed in this paper involve two-element compounds, i.e., A+B type binary compounds, so I will generally employ the term “second element” to refer to the non-initial elements of compounds. However, as we shall see below in (9), sai-sios can also occur in compounds containing more than two elements.
a consonant, nothing is written. In North Korea (DPRK), the symbol 〈 ’ 〉 between two elements was used until 1966, although not in Sino-Korean compounds.

Alternative appellations that can be encountered in the literature are sai soli or sai s’oli (lit. ‘intermediate sound’), sai pac’sim soli (‘intermediate support sound’; C’oi 1929/1972), t epenthesis (Ahn 1985), epenthetic s (Sohn 1994), short genitive (Ramstedt 1939), genitive s (Ramsey 1977), the syntactic marker q (Martin 1954, 1992), and gemination (Cook 1987). Although Korean sai-sios has not been as extensively studied as Japanese rendaku, it figures as a classical topic of Korean linguistic studies.

Morphophonologically, sai-sios has three exponents. It manifests itself as the tensing of the initial consonant of the second element of a compound where this consonant is an obstruent, as in (6), or in its gemination where it is a sonorant, as in (7). When the second element begins with a vowel and the first ends in a consonant, sai-sios consists, in a small number of examples, in the insertion of the coronal /t/ ([d]), as in (8). When the second element begins with any consonant other than /p, t, k, c, s, n, m/, that is, with an aspirate or already tense obstruent, with /h/, or with /l/, or when it begins with a vowel, sai-sios cannot be inserted (or is vacuously inserted). The surface realization of sai-sios is thus entirely predictable, once we know that the morphological marker has been inserted.

(6) a. /palle+ /pinu/ → /palle+p’inu/ [pallep’inu] ‘laundry’ + ‘soap’ → ‘laundry soap’
   b. /son/ + /tǐŋ/ → /son+tǐŋ/ [son’tǐŋ] ‘hand’ + ‘back’ → ‘back of hand’
   c. /k’o/ + /kumɔŋ/ → /k’o+k’umɔŋ/ [k’ok’umɔŋ] ‘nose’ + ‘hole’ → ‘nostril’
   d. /pi/ + /soli/ → /pi+s’oli/ [pis’ɔri] ‘rain’ + ‘sound’ → ‘sound of rain’

(7) a. /pata/ + /mul/ → /pata+mmul/ [padammul] ‘sea’ + ‘water’ → ‘sea water’
   b. /pe/ + /nole/ → /pe+nnole/ [pennore] ‘boat’ + ‘song’ → ‘sailors’ songs’
   c. /k’ɛ/ + /nip/ → /k’ɛ+nnip/ [k’ennip] ‘sesame’ + ‘leaf’ → ‘sesame leaf’

(8) /u/ + /os/ → /u+tos/ [udot’] ‘over’ + ‘cloth’ → ‘coat, upper garment’

Optional realizations of /palle+p’inu/ (6a), /k’o+k’umɔŋ/ (6c), and /pi+s’oli/ (6d), that is, of words whose first element ends in a vowel and whose second begins with an obstruent are [pallep’inu] or [pallet’p’inu], [k’ok’umɔŋ] or [k’ot’k’umɔŋ], and [pit’ɔri], with a geminate or a pseudo-geminate at the compound boundary.

According to Kang (2000), only four words can trigger [t] epenthesis before a second element beginning with a vowel, as in (8). These words are /u/ and /ui/, both meaning ‘over, above’, /co/ ‘Korean mat’, and /uiup/ ‘father-in-law’.

Like rendaku, sai-sios only appears in determinative compounds. It also obeys the so-called right-branch condition (Kawahara and Zamma: §2.4; Kawahara: §3.3.3). Cook (1991) mentions, for instance, the following two constructions.
Chapter 11. Rendaku in cross-linguistic perspective

(9) /cake/ + /sanŋ/ + /tali/ ‘lacquered’ + ‘table’ + ‘leg’
    → /cake+s’anŋ+t’ali/ → /cake+s’anŋ+t’ali/
    ‘[ lacquered table] leg’  ‘lacquered [table leg]’

Cook also claims that sai-sios applies cyclically, in a manner quite parallel to rendaku. For instance, in the compound /ilpon+k’ancaŋ+t’anci+k’aps/ ‘Japanese soy sauce jar price’, sai-sios has been inserted at the beginning of each rightmost constituent.

Phonologically, sai-sios has been characterized in the literature as:

(10) a. the insertion of a glottal stop, /ʔ/ or [ʔ] (Lee Sung-Nyong 1961; Kim Chin-Wu 1970)
b. the insertion of /t/ (Kim-Renaud 1975; Ahn 1985)
c. the tensing of the initial consonant of the second element and unreleasing of the final consonant of the first element (Lee Ki-mun 1972)
d. the association of a [+constricted glottis] feature associated to a root node (Sohn H-S 1987):

\[
\begin{array}{cc}
| & \\
& [+constricted glottis]
\end{array}
\]
e. the insertion of a [+tense] autosegment (Cook 1991)
f. the insertion of an empty skeletal slot with no root node (Kim Chin-Wu 1970; Lee Sechang 1995; Labrune 1999) or gemination (Cook 1987):

\[
/t/ \quad /t'/
\]
\[
\begin{array}{cc}
x & x \\
\vdash & \downarrow \\
\end{array}
\]

The number and variety of these analyses reflect the extreme complexity of the sai-sios phenomenon. The essential difficulty lies in the fact that, in contrast to rendaku, sai-sios exhibits three different surface realizations of a different phonological nature: one is featural (tensing), one is prosodic (gemination), and one is a full segment (/t/). The approach adopted in this paper being mainly descriptive and comparative, I shall not go into the details of the formal representation of the underlying form of the Korean sai-sios. (The interested reader can refer to the above-mentioned references.) However, it is important to notice that one of the exponents of sai-sios is prosodic augmentation (realized as gemination), a word compounding process which is actually attested in other languages, for instance Malayalam (see §11.6.7 below). Although not an FLE in the strict sense of the term following Trommer (2014), I nevertheless include prosodic augmentation occurring at the boundary between two compound elements in the class of FLEs.
A popular analysis among Korean linguists (e.g., Huh 1958: 442; Con 1990; Lee Sung-Nyong 1961; Lee Ki-mun 1972: 120) is that sai-sios is inserted in order to prevent voicing (which is seen as a lenition process) of the initial consonant of the second element. It is also sometimes assumed that sai-sios serves to create a “strong consonant” in order to maintain the identity of the second element. Viewed from this perspective, sai-sios should be analysed as a fortition process. However, these explanations do not account for the fact that sai-sios does not solely target consonants which are likely to voice intervocalically, since it also transforms a single nasal into a geminate.

According to Kim-Renaud (1975: 169) and references cited therein, the modern sai-sios comes from an old honorific genitive marker sa or sa, attested in Middle Korean. If so, the orthographic s ( schedular ) would be the synchronic residue of this former particle, and the origin of sai-sios would be comparable to that of rendaku (Vance 2015a: 399–402). Incidentally, it is worth mentioning that the /s/ sound appearing in Japanese compounds such as haru same ‘spring rain’ (from haru ‘spring’ and ame ‘rain’) or uru sine ‘non-glutinous rice plant’ (uru ‘nonglutinous rice’ + ine ‘rice plant’) is sometimes considered as cognate with the Korean sai-sios (Martin 1987: 36).

The examples provided above illustrate prototypical cases of Korean sai-sios. However, just like Japanese rendaku, a closer look at sai-sios reveals a number of complications.

First, it is not always clear whether or not some compounds have undergone insertion of the linking element or not. As noted in (5d), the initial consonant of a second element obligatorily undergoes tensing after an obstruent. This happens in cases where the first element of the compound ends in /p t c k s/. Consider for instance the following two examples.

\[(11)\]
\begin{align*}
\text{a.} & \quad /\text{pap}/ + /\text{kaps}/ \rightarrow /\text{pap}+\text{k}^{'\text{aps}}/ \quad [\text{pap}^{'\text{k}\text{aps}^{'}}] \quad \text{‘price of meal’} \\
\text{b.} & \quad /\text{c}^{'\text{ap\text{k}}}/ + /\text{c}^{'\text{ap\text{k}}}/ \rightarrow /\text{c}^{'\text{ap\text{k}}}{\text{c}}^{'\text{ap\text{k}}}/ \quad [\text{c}^{'\text{b}^{'\text{ap\text{k}}}}] \quad \text{‘rambling’}
\end{align*}

In both examples, the second element undergoes tensing of the initial consonant. (11a) /pap+k’aps/ is a word in which sai-sios is very likely to occur, because it fulfills all the necessary phonological, morphological, and semantic criteria. However, even if sai-sios were not inserted, the /k/ in /kaps/ would obligatorily tense after /pap/ by virtue of POT, since it occurs after another obstruent. We thus have no way of deciding whether this is a case relevant to sai-sios insertion, or merely a case of POT. On the other hand, in \([\text{c}^{'\text{b}^{'\text{ap\text{k}}}}] (11b), a reduplicated mimetic, we know that the tensed \([\text{c}']\) cannot result from sai-sios insertion, because sai-sios never occurs in reduplicated mimetic compounds. The tensing in \([\text{c}^{'\text{b}^{'\text{ap\text{k}}}}]\) is nothing more than the outcome of the POT rule.
Ambiguous examples such as /pap+k’aps/ are reminiscent of the voicing which occurs after the mora nasal in Japanese, which is not always distinguishable from post-nasal voicing, that is, the automatic voicing of an obstruent occurring after the moraic nasal (Vance and Asai: §8.3.1). The general impression, though, is that POT is much more pervasive in Korean than post-nasal voicing in Japanese, because it is an exceptionless rule.

A second complication is that the orthography of contemporary Korean is misleading, since sai-sios is not always written. In fact, it cannot be graphically represented when the first element ends with a syllable containing a coda whose final letter occupies the graphic space where sai-sios would be written. This happens for instance in the compound /son+t’ɨŋ/ ‘back of the hand’ (‘hand’+‘back’), spelled ⟨손등⟩ (son tinj). Here, the presence of the hangeul letter ⟨-⟩ at the bottom of the first element ⟨손⟩ leaves no room for the ⟨-⟩ to be written. Moreover, an orthographic mismatch lies in the fact that sai-sios, although written by means of the letter ⟨ㅅ⟩, which represents the sound /s/, is actually never phonetically realized as a coronal fricative in present-day Korean. The discrepancy between the actual nature of the phenomenon and the way it is conceived and represented in the orthography may lead to considerable differences in treatments of the phenomenon in linguistic studies, depending on whether it is approached from a graphic or a phonic angle.

Thirdly, and most importantly, just as with rendaku in Japanese, the insertion of sai-sios is extremely variable and largely unpredictable, as the following examples illustrate.

(12) a. /mul/ + /koki/ → /mul+k’oki/ [mulk’ogi] *[mulgogi] ‘water’ + ‘meat’ → ‘fish’

b. /kim/ + /pap/ → /kim+p’ap/ [kim’ap’] *[kimbap’] ‘seaweed’ + ‘cooked rice’ → ‘rice roll, kimbap/gimbap’
    /kʰoŋ/ + /pap/ → /kʰoŋ+pap/ [kʰon’ap’] *[kʰon’p’ap’] ‘bean’ + ‘cooked rice’ → ‘rice cooked with beans’

Although very similar in their morphological, semantic, and phonological structures, the two compounds in each pair behave differently with respect to sai-sios insertion: sai-sios occurs in /mul+k’oki/ and in /kim+p’ap/, but it does not in /pul+koki/ and /kʰoŋ+pap/. There is no obvious phonological, morphological, or semantic reason why this should be so.

In some other compounds, sai-sios insertion is optional, that is, two different compounds exist, one with sai-sios and one without, and the meaning of the two
is identical. For instance, the name of sai-sios itself may be sai-sios or sai-s’ios (i.e., /sai+sios/ or /sai+s’ios/). Similarly, the compound meaning ‘nasal singing’ (‘nose’+’song’) is either /kʰonole/ or /kʰonool/. This variability resembles that of pairs like iri+kuti/iri+guti ‘entrance’ in Japanese (Irwin: §6.3.1).

Another pattern of variability is that two compounds made up of the same lexical items may co-exist but with a different meaning, the semantic difference being reflected exclusively in the presence or absence of sai-sios (Kim Jong-mi 1992). For instance:

(13) a. /ceːsam/ + /kwa/ → /ceːsam+kwa/ 第三課
‘third’ + ‘part’ → ‘third part (of a book)’

b. /namu/ + /pɛ/ → /namu+pɛ/ [namu:pɛ]
‘wood’ + ‘boat’ → ‘a boat made of wood’

Finally, one should also not forget that there is considerable dialectal variation in the insertion of sai-sios. For instance, Martin (1954: 55) observes that it is much more infrequent in the South (e.g., Taegu, Pusan) than in Seoul and in the North.

Sai-sios thus characterizes itself as a highly irregular, variable and idiosyncratic phenomenon, just like rendaku in Japanese. Further, just like rendaku, there exist a number of factors which may favor or block sai-sios. Interestingly, many of these factors are the same as those found in rendaku: susceptibility to sai-sios primarily depends on etymological, lexical, phonological, morphological, and semantic factors.

Sai-sios is triggered most often in native Korean elements, and most of the examples presented so far have been native Korean words, although /ceːsam+kwa/ and /ceːsam+k’wa/ in (13a) are Sino-Korean compounds. However, sai-sios also occurs in many Sino-Korean words. Like Sino-Japanese words, Sino-Korean words are ancient loans from Chinese which occur prototypically as binoms (Vance and Asai: §8.1) and which can be written in hanca 漢字, that is, in sinographs. However, unlike Japanese, and with only a few exceptions, Sino-Korean sinographs have only one reading, a so-called Sino-Korean reading. Except in cases where the POT rule applies, the occurrence of sai-sios is therefore easy to identify in Sino-Korean compounds, unlike rendaku in Sino-Japanese binoms (Vance 2011).

6. Research on the variability of rendaku across dialects is still in its infancy (Miyashita et al. P10).
Sino-Korean compounds in which sai-sios occurs are generally familiar, well-integrated words, like those in (14).

(14)  

a. /han/ + /ca/ → /han-c’a/ 漢字 [hanc’a] ‘Chinese character’  
b. /sa/ + /kɔn/ → /sa-kɔn/ 事件 [sakɔn] ‘event’  
c. /san/ + /po/ → /san-p’o/ 散歩 [sanpo] ‘a walk’

Notice that sais-sios appears between the two elements of the Sino-Korean binoms in (14). A comparable example in Japanese would be ka·zan 火山 ‘volcano’, from ka ‘fire’ and san ‘mountain’. However, Korean examples like the ones in (14) seem to be much more frequent than the corresponding Sino-Japanese ka·zan type.7

In contrast, compounds made up of two Sino-Korean binoms (thus corresponding to four sinographs in their most prototypical shape, with a compound boundary between the second and third sinographs) seem to undergo sai-sios insertion much less frequently than Sino-Japanese compounds of a similar structure undergo rendaku insertion. Interestingly, sai-sios appears more readily between a Sino-Korean binom and a Sino-Korean mononom than between two binoms, as shown in the examples below.

(15)  

a. /in·mun/ + /kwa/ → /in·mun+k’wa/ 人文科 ‘department of humanities’  
/bimun/ + /kwa-hak/ → /in·mun+kwa-hak/ 人文科学 ‘human studies’  
b. /ki·pon/ + /kɔn/ → /ki·pon+k’ɔn/ 基本権 ‘basic right’  
/ki·pon/ + /kɔn·li/ → /ki·pon+kɔn·li/ 基本権利 ‘basic principle’

Sai-sios appears in /in·mun+k’wa/ in (15a) and in /ki·pon+k’ɔn/ in (15b), whose final elements correspond to one sinograph (and one syllable), but not in /in·mun+kwa-hak/ and /ki·pon+kɔn·li/. There are many such examples in the Sino-Korean lexicon. Lee Chungmin (1972; cited by Kim-Renaud 1975: 166) says that sai-sios is blocked when both constituents are polysyllabic (he claims this applies to any type of compound, either Sino-Korean or native), but the relevant factor may lay somewhere else. As far as linking elements are concerned, this is one of the most striking differences between Japanese and Korean words of Chinese origin and one which undoubtedly requires further investigation.

At the beginning of other non-native words (i.e., those of non-Chinese origin, such as loans from Western languages or from Japanese), sai-sios is quite infrequent, although some examples, like those in (16), can be found.

---

7. In relation to this discussion, it is also interesting to observe that there are very few Sino-Korean morphs which begin with a primarily fortis consonant, whereas there are plenty of Sino-Japanese morphs beginning with a primarily voiced consonant, such as doku 毒 ‘poison’, gaku 学 ‘study’, etc. (Takayama Tomoaki, p.c.)
Reduplicated words never undergo sai-sios. This is true of reduplicated mimetics such as /sokon+sokon/ [soŋkoŋ箩ŋ] ‘in whispers’ or /panil+panil/ [panilpanil] (*[panilp'anil]) ‘with a smile’, as well as of reduplicated constructions which have a plural, intensive, collective, or distributive value, like /salam+salam/ (*/salam+s'alam/) ‘many people’ or ‘each person’ (cf. Japanese hito+bito; IRWIN:§6.1.2). Here too, the difference with Japanese is noteworthy, since Japanese reduplicated lexemes with a plural meaning generally do undergo rendaku (Labrune 2012:118; Nishimura 2013:83–87).

As is the case with rendaku (IRWIN:§6.1.2), Korean coordinate (dvandva) compounds consistently resist sai-sios insertion.

According to Sohn (1994), sai-sios does not occur in noun+verb compounds (but a few exceptions can be found). Sohn provides the following examples.

This, once more, is reminiscent of a constraint operating in Japanese noun+verb compounds (Vance 2015a:429–431). The examples /son+pal/ (17a) and /son+capi/ (18b) are interesting; since /son/ is a noun which nearly always triggers sai-sios insertion as a first element, we may infer that it is the verbal origin of the second element which is responsible for the failure of sai-sios to apply.

/ços/ 'shrimp' as a second element is a sai-sios hater. On the other hand, Martin also says that the words /salam/ 'person', /pam/ 'night', /cip/ 'house', /pan/ 房 'room', /kwa/ 課 'department', /kaps/ 'price', as well as /sil/ 室 'room', /ca/ 字 'character', /pop/ 法 'law', and a few other items have a high probability of triggering sai-sios when they occur as second elements. Notice that some of these words are Sino-Korean. I Munsang (2004) has also pointed out that frequent words undergo sai-sios insertion more often than infrequent ones, as in the examples in (14) above.

A number of other miscellaneous factors have been occasionally reported. Additional research is needed to clarify their reality, since contradictory descriptions or analyses are not infrequent. Some factors which have been said to favor or disfavor sai-sios include the following.

- When the second element is (or both the first and second elements are) monosyllabic, sai-sios occurs more frequently (Lee Chungmin 1972; Kim-Renaud 1975:166; Zuraw 2011; Ito 2012). Ahn (1985:90–91) says that what should be taken into consideration is whether the second element is monomorphemic, in which case tensing occurs, regardless of its number of syllables.

- A first element ending with /l/ favors the triggering of sai-sios, as in /pal∙t'al/ 發達 'development'. According to some authors, this factor is restricted to Sino-Korean compounds, especially if the final element is one-syllable long (Kim-Renaud 1975; Sohn 1994). Martin (1954:54) also claims that when the second element starts with /s/ or /c/, sai-sios occurs more frequently.

- When the second element has an abstract meaning, sai-sios is more likely to appear. I Munsang (2004) noted that /sacaŋ+/cali/ 社長+ 자리 ('director'+'seat'), realized as /sacaŋ+c'ali/ (with sai-sios), means 'director's position, situation, but 'director's chair' when it is realized with no sai-sios as /sacaŋ+cali/.

- In loan coinages (i.e., in words newly coined in Korean rather than in direct loans) sai-sios is more likely to be triggered (Cho 1990:154). An example is /no∙ca/ 老字 'the character no 老' (cf. /no/ 老, /ca/ 字 'letter') vs. /no-ca/ 老子 'Lao-tzu'.

- When the first element is animate (Kim Jong-mi 1992; Yun 2006 cited by Ito 2012) or has the semantic feature [+material] (Kim-Renaud 1975; Yun 2006 cited by Ito 2012), sai-sios is blocked.

- When the first element (I Munsang 2004) or when one of the two elements (Zuraw 2011; Ito 2012) already contains a tense obstruent, sai-sios occurs less frequently. This restriction is, of course, reminiscent of Lyman's Law in Japanese (VANCE: §1.4), but there is no question it is not as strong in Korean as Lyman's Law is in Japanese.

Sai-sios manifests itself through tensing of an obstruent, gemination of a sonorant, or /t/-insertion and serves to indicate that a determinative compound is created. Factors that favor or block sai-sios may be phonological, semantic, lexical/etymological, or syntactic. Sai-sios is also pervasively irregular, and there exist sai-sios immune
words and sai-sios lovers. Another noteworthy characteristic is that there is surface convergence between sai-sios and other phonological rules in Korean, especially the POT rule. The resemblance between Korean sai-sios and Japanese rendaku is readily obvious. The main differences between the two lie in the fact that sai-sios occurs more readily in two-character Sino-Korean words than in four-character ones, that reduplicated words never undergo sai-sios insertion in Korean, and in the absence in Korean of a dissipilatory constraint as strong as Lyman's Law, even though the tendency to avoid sai-sios when one of the elements already contains a tense obstruent has been reported (I Munsang 2004; Zuraw 2011; Ito 2012), as mentioned above.

To conclude, Table 1 summarizes the comparison between Japanese rendaku and Korean sai-sios.

Table 1. Comparative summary: rendaku and sai-sios

<table>
<thead>
<tr>
<th></th>
<th>Rendaku</th>
<th>Sai-sios</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exponence:</td>
<td>– voicing</td>
<td>– tensing</td>
</tr>
<tr>
<td>Licensors:</td>
<td>– voiceless obstruents</td>
<td>– lenis consonants</td>
</tr>
<tr>
<td>Convergence with:</td>
<td>– post-nasal voicing</td>
<td>– post-obstruent tensing</td>
</tr>
<tr>
<td>Concomitants:</td>
<td>– apophony9</td>
<td>– ?</td>
</tr>
<tr>
<td>Variability:</td>
<td>– high</td>
<td>– high</td>
</tr>
<tr>
<td><strong>Main Blocking Factors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semantic:</td>
<td>– coordinate compounds</td>
<td></td>
</tr>
<tr>
<td>Lexical:</td>
<td>– loanwords (including Chinese loans)</td>
<td>– 2nd element bisyllabic or longer</td>
</tr>
<tr>
<td></td>
<td>– immune native words</td>
<td>– one of two elements already contains tense consonant</td>
</tr>
<tr>
<td>Phonological:</td>
<td>– Lyman’s Law</td>
<td></td>
</tr>
<tr>
<td>Morphological:</td>
<td>– reduplication (except to express plurality)</td>
<td>– reduplication</td>
</tr>
<tr>
<td>Syntactic:</td>
<td>– object (accusative case) noun+verb</td>
<td>– noun+verb</td>
</tr>
</tbody>
</table>

8. This paper basically follows Ito and Mester (2003a:83), who propose that rendaku is a feature-sized linking morpheme consisting of the specification [+voice].

9. As in /ame/ + /to/ → /ama+do/ (‘rain’ + ‘door’ → ‘shutter’) or /ki/ + /tama/ → /ko+dama/ (‘tree’ + ‘spirit’ → ‘spirit of a tree’).
11.4 Basque

Basque is an agglutinative language spoken in southwestern France and north-eastern Spain, straddling the Pyrenees. It is a linguistic isolate. In a number of Basque compounds, a consonant alternation which fits the definition of an FLE occurs second-element initially. Following Labrune (2014a), this FLE will be labeled lotura (hereafter used without italicization). Before going into the details of the lotura data, I will provide general information about Basque phonology and morphology.

Standard Basque has five vowels /i u e o a/ and 22 or 23 consonants, /p t tt[c] k b d dd[j] g tz[tς] ts[tς] tx[tʃ] f z[s] s[s] x[f] j[x]/j[j] m n [n] r[r] rr[r]/ (Hualde and Ortiz de Urbina 2003). The laryngeal fricative /h/, which is found in northern dialects and is represented in the official orthography of the standard language, may be added to this inventory. Symbols enclosed in square brackets denote the corresponding IPA phones. Basque orthography being largely phonemic and the value of most letters close to the IPA (except for the consonants whose IPA corresponding symbols have been provided in the above list), all examples will be given in the standard spelling. For example, txirrinduz ‘by bike’ corresponds to /txirrinduz/ [tʃirindus].

The main characteristics of the Basque phonological system are the existence of a series of affricate consonants, and a three-way place opposition for fricatives and affricates: lamino-alveolar (/z/ [s], /tz/ [tς]), apico-alveolar (/s/ [s], /ts/ [tς]), and alveolo-palatal (/x/ [ʃ], /tx/ [tʃ]). There is a voicing opposition only with plosives, since there are no voiced fricatives or affricates in Standard Basque. This is important to note with respect to the lotura phenomenon.

The phonetic or phonological processes relevant to understanding the examples discussed in this section are the following.

(19) a. post-sonorant affrication, a process by which a word-internal fricative becomes an affricate when preceded by a sonorant (For instance, the words ambulancia and universitate(m) have been respectively phonologically adapted as /anbulantzia/ and /unibertsitate/.)

b. deaffrication, which causes an affricate to become a fricative before a non-continuant consonant, as in /idatz-/+/-ten/ (‘write’+IMPERFECTIVE PARTICIPLE) → /idaz-ten/ ‘writing’, /ahots/+/-kera/ (‘voice’+‘manner’) → /ahos+kera/ ‘pronunciation’

c. post-fricative devoicing, whereby plosives tend to undergo devoicing after a fricative, e.g., /ahots/+/-dun/ → /ahos+tun/ (‘voice’+‘having’) → ‘voiced’ (Hualde and Ortiz de Urbina 2003:42) (This change is not always reflected in the orthography and is largely unsystematic.)

All rights reserved
d. consonant fusion (The first in a sequence of two plosives may be deleted, while the second undergoes devoicing, as in /bat+/batean/ → /ba+patean/ 'suddenly', or /nik/ +/dakit/ → /ni+takit/ 'I know'. This process is optional and not always reflected in the orthography.)

A noteworthy characteristic of the Basque lexicon is that it contains a high number of loans, borrowed over the centuries from Latin and the surrounding Romance languages.

Although the consonant alternations recognized as lotura in this chapter are generally mentioned and commented on in major studies on Basque phonology and morphology, such as Gavel (1920), Villasante (1976), Michelsen (1977), Txillardegi (1982), Mujika (1982), Azkarate (1990, 1991), Artigoitia (1993), Hualde (1994), Hualde and Ortiz de Urbina (2003), etc., they have not been recognized as a single phenomenon. Most authors link one or two sets of data and generally comment on their idiosyncratic character and the possible rules they arguably identify. A uniform approach to the full range of consonant alternations involved in compounds under the label “lotura” was first made by Labrune (2014a). The data discussed in this section are largely based on this latter study, with references also to other of the works cited above.

The lotura mark is inserted in determinative compounds. It has three different phonological exponents: it manifests itself through the devoicing of a voiced plosive (/b d g/ → /p t k/), the affrication of a fricative (/z s x/ → /tz ts tx/), or the insertion of /t/ when the second element of the compound begins with a vowel or with /h/. Representative examples are given in (20)–(22).

(20) a. /su/ + /bazter/ → /su+pazter/ ‘fire’ + ‘corner’ → ‘hearth’
   b. /uste/ + /gabe/ → /uste+kabe/ ‘belief’ + ‘lack’ → ‘surprise’
   c. /behi/ + /gorotz/ → /be+korotz/ ‘cow’ + ‘excrement’ → ‘cow dung’
   d. /agin-/ + /bide/ → /agin+pide/ ‘to order’ + ‘way’ → ‘authority’
   e. /eda-/ + /dun/ → /eda+tun/ ‘to drink’ + ‘someone who’ → ‘drinker’

The example in (20d), /agin+pide/, is interesting because it shows that the devoicing induced by the lotura can occur after a sonorant, even though sonorants frequently cause the voicing of a following plosive (Hualde & Ortiz de Urbina 2003:20,43).

(21) a. /zaldi/ + /zain/ → /zal+tzain/ ‘horse’ + ‘keeper’ → ‘groom’
   b. /ogi/ + /sein/ → /o+tsein/ ‘bread’ + ‘child’ → ‘servant’
   c. /kaska/ + /xuri/ → /kaska+txuri/ ‘skull, head’ + ‘white’ → ‘white-haired’

(22) a. /su/ + /ondo/ → /su+tondo/ ‘fire’ + ‘side’ → ‘fireside’
   b. /begi/ + /ilun/ → /be+tilun/ ‘eye’ + ‘dark’ → ‘sad, austere’
Chapter 11. Rendaku in cross-linguistic perspective 215

Notice that lotura sometimes co-occurs with the deletion of the final syllable of the first element, as in (20c), (21a), (21b), (22b), and (22e). The number of words which are susceptible to such final syllable deletion (or in some rare cases, final segment deletion) amount to about 30, among which around 10 can be considered frequent.11

Lotura compounds are determinative compounds made up of two nouns, as in /su+pašter/ (20a), a noun plus an adjective, as in /be+tilun/ (22b), a verb participle plus a noun, as in /agin+pide/ (20d) and /ikas+turte/ (22d), or more rarely, a noun plus a participle, as in /ipur+terre/ (22e).

The origins of lotura are unknown and, with the exception of Schuchardt (1903), who proposed that the /t/ of erret bide which is attested in medieval Navarrese written documents (corresponding to modern Basque errepide ‘national road’ < /errege+/bide/) is a vestige of an ancient element traceable to Iberian, no hypothesis has ever been put forward concerning its origins. In passing, it should be noted that the genitive markers of Basque, (r)en and -(e)ko, do not seem to be phonetically connected to any of the exponents of the lotura mark, at least in a straightforward manner.

Labrune (2014a) proposes that the lotura mark be represented by the features [−voice, −continuant]. In this way, its final surface realization depends on the phonological structure of its host segment. Thus, the marker is implemented as devoicing when the initial plosive of the second element is a plosive already specified as [+voice, −continuant]; the feature [+voice] simply overwrites the feature [−voice] of the original consonant, and the [−continuant] feature is already present. When the initial consonant is a fricative, the insertion of lotura adds the feature [−continuant] to the [+continuant] fricative, while the [−voice] feature remains inactive. (Remember that all standard Basque fricatives and affricates are phonologically voiceless.) If, following Sagey (1990:52) and Hualde (1994: ch.5), affricates are considered to be doubly specified as [+continuant] and [−continuant], the resulting segment will be a voiceless affricate which bears both the features [−continuant] and [+continuant]. Finally, lotura is phonologically implemented

10. Orthographic h is mute in Standard Basque, but it is still pronounced as a laryngeal fricative in a number of Northern dialects.

11. Final syllable (or segment) deletion in the first element generally co-occurs with lotura insertion, but there are actually a few compounds which exhibit final deletion without lotura insertion (see Labrune 2014a).
as a coronal plosive /t/ when the second element of the compound begins with a vowel (or with a graphic h). The place feature [coronal] is acquired by default. Under this analysis, the lotura mark is thus reducible to a single set of autosegmentalized features, and its surface realization is always predictable, depending on the phonological structure of the host. As in Japanese and in Korean, what is not predictable is whether the mark is inserted or not.

The Basque lotura exhibits a number of properties which are strikingly reminiscent of Japanese rendaku and Korean sai-sios.

First, lotura appears as a pervasively irregular and idiosyncratic process. Consider, for instance, the following examples.

(23)  

a. /ezkon-1 + /egun/ → /ezkon+t+egun/ ‘to marry’ + ‘day’ → ‘wedding day’
b. /ehortz-1 + /egun/ → /ehortz+egun/+ ‘to bury’ + ‘day’ → ‘funeral day’
c. /ehortz-1 + /etxe/ → /ehortz+t+etxe/ ‘to bury’ + ‘house’ → ‘funeral house’
d. /solas/ + /bide/ → /solas+bide/ ‘speech’ + ‘road, manner’ → ‘subj. of conversation’
e. /arnas/ + /bide/ → /arnas+bide/ ‘breath’ + ‘road, manner’ → ‘resp. system; trachea’

In (23a) and (23b), we have compounds made up of a verb participle followed by the noun /egun/. While /ezkon+t+egun/ ‘wedding day’ undergoes lotura-driven /t/-insertion, /ehortz+egun/ ‘funeral day’ does not. Furthermore, observe that /ehortz-1/ triggers /t/-insertion when combined with /etxe/ in (23c). Identifying a reason why lotura is inserted in (23a) and (23c) but not in (23b) appears impossible. Similarly, /bide/ ‘way, road, manner’, a very common second element in compounds, occurs either as /-pide/, as in (23d), or as /-bide/, as in (23e). Note that in spite of the preceding fricative, which often favors devoicing in Basque (see 19c above), /bide/ does not devoice in /arnas+bide/ (23e).

In other cases, a compound may occur with two variants, one with the lotura alternation and the other without. Examples include /be+tokker/ or /begi+oker/ (‘cross-eyed’), /eri+t+etxe/ or /eri+etxe/ (‘hospital’), and /bihoz+b+era/ or /bihoz+p+era/ (‘clement’), without any difference in meaning. The two variants can sometimes occur in the speech of a single speaker.

But two compounds made up of the same lexemes can also co-exist with different meanings. For instance:

(24)  

a. /errege/ + /bide/ ‘king’ + ‘road, manner’
   → /errege+p+ide/ ‘national road’
   → /errege+bide/ ‘the king’s road’, i.e., ‘road that has been built for the king’
b. /hel-1 + /bide/ ‘to reach’ + ‘road, manner’
   → /hel+p+ide/ ‘help’
   → /hel+bide/ ‘address’ or ‘access road’

Variation in lotura compounds may simply reflect dialectal differences. Mujika (1982) mentions many such examples, for instance /egos+b+era/ (Lower Navarre,
Chapter 11. Rendaku in cross-linguistic perspective 217

Higher Navarre) vs. /egos+pera/ (Higher Navarre, Bizcay, Gipuzkoa) ‘easy to cook’, and /ikas+gai/ (Gipuzkoa) vs. /ikas+kai/ (Bizcay) ‘lesson’.

Second, it is sometimes hard to say whether an alternation is to be regarded as resulting from lotura insertion or from the application of one of the phonological processes described above in (19a) and (19c), whose outcome is affrication or devoicing. So, whether it contains the lotura mark or not, the word /haz+pizar/ ‘hangnail, ragnail’, from /hatz/+/bizar/ (‘finger’+ ‘beard’), would anyway be a perfect candidate for post-fricative devoicing, which can cause devoicing in all sorts of contexts, including compounds which cannot countain the lotura mark for morphological reasons. The same goes for /euskal+tzain/ ‘Basque Academy’, from /euskal/+/zain/ (‘Basque’+‘keeper’), whose affricate could result from the post-lateral affrication rule. There is absolutely no way to determine with certainty whether such cases are instances of lotura or not. Remember that the same kind of ambiguity arises with Japanese rendaku and Korean sai-sios, a phenomenon that I call convergence.

Only native Basque lexemes undergo lotura insertion. The rare exceptions involve a handful of old Latin loans such as /errege/ ‘king’ and /abade/ ‘abbot’, which occur as first elements of lotura compounds with final syllable loss, and /gurutz/ ‘cross’, /gailu/ ‘tool’, and /ordu/ ‘hour’, used as second elements with the forms /-kurutz/, /-kailu/, and /-tordu/. But recent loans are never affected by lotura.

Several authors (e.g., Michelena 1977: 237; Mujika 1982: 89; Villasante 1976: 39) have observed that lexemes which undergo final syllable deletion in lotura compounds mostly end in /-di/, /-gi/, and /-hi/ (and, to a lesser extent in /-gu/, /-ge/, /-de/), so phonological conditioning might govern lotura appearance. Gavel (1920: 97) also suggested a possible semantic factor, since a significant proportion of the words undergoing final deletion refer to animals, especially cattle nouns, or to body parts. However, these explanations can only be partial, since counter-examples are quite easily found.

Moreover, there exist, without doubt, a number of “lotura lovers,” that is, words which trigger lotura more frequently than others when they appear as the first or second element of a compound. Examples of lotura lovers when used as first elements include /begi/ ‘eye’, /ipurdi/ ‘buttocks’, /ardi/ ‘sheep’, /gurdi/ ‘cart’, /ikas-/ ‘to learn’, /jaio/ ‘to be born’, /zaldi/ ‘horse’, and /su/ ‘fire’. Lotura lovers as second elements include /bide/ ‘way, manner’, /ezin/ ‘inability’, /gaitz/ ‘difficult’, /gailu/ ‘tool’, /etxe/ ‘house’, /-dun/ ‘the person who’, /bera/ ‘tendency’, and /buru/ ‘head’. On the other hand, a number of words appear to resist lotura consistently even under phonological conditions that are known to favor the alternation, for instance after a fricative or an affricate. Thus /gari/ ‘wheat’, /gizon/ ‘man’, /bihotz/ ‘heart’, /beltz/ ‘black’, and many others are totally lotura immune when they occur as second elements in a compound. Note that these words are among the most
frequent in the Basque language, occur in many compounds, and are all native. So /beltz/ ‘black’ remains /beltz/ even after one of the most powerful lotura triggers, /ipurdi/, yielding /ipur+beltz/, never */ipur+peltz/ ‘black ass’. As far as first elements are concerned, it would seem that /itsaso/ (occurring as the bound allomorph /itsas/ in many compounds) ‘sea’, /mendi/ ‘mountain’, /negu/ ‘winter’, and /mihi/ ‘tongue’, to cite but a few, never trigger lotura. Such examples should be compared to /ikas-/ ‘learn’, /ardi/ ‘sheep’, /sagu/ ‘mouse’, /behi/ ‘cow’, etc., all lotura triggers, even though they exhibit a similar morphophonological profile.

Apart from such (apparently) unaccountable exceptions, as in the Japanese and Korean cases, lotura insertion or non-insertion is also constrained by a number of factors.

A robust blocking factor is reduplication. Reduplicated words, be they mimetics or of any other kind, never exhibit lotura alternation. Compounds like /barra+barra/ ‘profusely’ and /sigi+saga/ ‘zig-zag’, which are mimetics, and /gorri+gorri/ ‘very red’ (/gorri/ ‘red’) and /behi+behin(-ean)/ ‘only once’ (/behi/ ‘once’), which are intensive reduplications, illustrate this fact. (Basque does not use reduplication to indicate plurality, as Japanese or Korean do.) Apparent exceptions like /ba+patean/ ‘all of a sudden’ (from /bat+bat(ean)/, /bat/ ‘one’) have to be analyzed as resulting from the application of one of the rules given in (19), in this case, consonant fusion: /t+b/ → /p/.

In addition, it is interesting to note that coordinate compounds never undergo lotura. Consider these examples in (25).

(25)  

(a) /begi/ + /sudur/ → /begi+sudur/ */be+tsudur/  
     ‘eye’ + ‘nose’ → ‘eyes and nose’
(b) /gora/ + /behera/ → /gora+behera/ */gora+p?ehera/  
     ‘up’ + ‘down’ → ‘ups and downs’
(c) /errege/ + /erre?egina/ → /errege+erre?egina/ */erre+terre?egina/  
     ‘king’ + ‘queen’ → ‘the king and queen’
(d) /argi/ + /ilun/ → /argi+ilun/  
     ‘light’ + ‘dark’ → ‘light and shade’

Interestingly, the combination of /argi/ ‘light’ and /ilun/ ‘dark’ yields two different words: one, without lotura as in (25d), is a coordinate compound, while the other, with lotura, /ar+tilun/, is a subordinative (i.e., determinative) compound meaning ‘eclipse’. This kind of example is quite comparable to the oft-cited Japanese pair yama+kawa ‘mountains and rivers’ vs. yama+gawa ‘mountain river’. They are also to be compared to the Korean examples given in (17) above.

The Basque lotura undeniably exhibits several properties in common with Japanese rendaku and Korean sai-sios, be it at the level of formal characteristics, the types of factors which favor or block their insertion, or the existence of
“convergence” phenomena. A characteristic of lotura but neither of rendaku nor of sai-sios is the fact that lotura sometimes co-occurs with deletion of phonological material at the end of the first element.

By way of conclusion, Table 2 offers a summary comparison of the main characteristics of Japanese rendaku and Basque lotura (cf. Table 1).

Table 2. Comparative summary: rendaku and lotura

<table>
<thead>
<tr>
<th></th>
<th>Rendaku</th>
<th>Lotura</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exponence:</td>
<td>– voicing</td>
<td>– devoicing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– affrication</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– /t/-insertion</td>
</tr>
<tr>
<td>Licensors:</td>
<td>– voiceless obstruents</td>
<td>– voiced plosives</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– fricatives</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– empty onsets</td>
</tr>
<tr>
<td>Convergence with:</td>
<td>– post-nasal voicing</td>
<td>– post-sonorant affrication</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– consonant fusion</td>
</tr>
<tr>
<td>Concomitants:</td>
<td>– apophony</td>
<td>– deletion of final syllable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(or segment) of 1st element</td>
</tr>
<tr>
<td>Variability:</td>
<td>– high</td>
<td>– high</td>
</tr>
<tr>
<td><strong>Main Blocking Factors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semantic:</td>
<td>– coordinate compounds</td>
<td></td>
</tr>
<tr>
<td>Lexical:</td>
<td>– loanwords</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– immune words</td>
<td></td>
</tr>
<tr>
<td>Phonological:</td>
<td>– Lyman’s Law</td>
<td>?</td>
</tr>
<tr>
<td>Morphological:</td>
<td>– reduplication (except to express plurality)</td>
<td>– reduplication</td>
</tr>
<tr>
<td>Syntactic:</td>
<td>– object (accusative case)</td>
<td>noun+verb</td>
</tr>
<tr>
<td></td>
<td></td>
<td>?</td>
</tr>
</tbody>
</table>

11.5 **Excursus: On some intriguing properties of voiced obstruents in Japanese, tense consonants in Korean, and voiceless and affricate consonants in Basque**

Interestingly, the consonants which serve as exponents of the FLE in Japanese, in Korean, and in Basque exhibit a number of intriguing common properties in their respective systems. Three of these properties deserve special attention with respect to...
to the FLE issue. First, in all three languages, the relevant consonants occur rarely, or do not occur at all, at the beginning of words from the native stratum. Hence, the result of FLE insertion is a word-structure otherwise not originally permitted in the language. Second, and as a corollary of the first point, these consonants are known to have phonologized relatively late and in a secondary manner in the history of the language. Finally, the consonants serving as FLE exponents (voiced obstruents in Japanese, fortis consonants in Korean, voiceless plosives in Basque) and their “plain” versions (the consonants without the feature involved in FLEs, i.e., unvoiced consonants in Japanese, lenis stops in Korean, voiceless plosives in Basque), although considered as fully distinctive in the three modern languages, exhibit many non-distinctive alternations, as the examples provided below will illustrate. In addition, the consonants involved in FLE realization may possess other special language-internal properties not found in the other two languages, but the point is that they somehow stand apart from the other consonants of the system, and that their special status has been noted independently from their role as exponents of the FLE.

In Japanese, it is well known that voiced obstruents do not occur word initially in native words (with the exception of mimetics). For a number of Japanese linguists, rendaku’s very *raison d’être* is closely related to this property. For instance, Komatsu (1981: 104) argues that it is precisely because they never occurred word-initially that voiced obstruents could function as composition markers in Old Japanese. Moreover, it is also well attested that voiced obstruents developed out of prenasalized sequences in the history of Japanese, and that voicing was probably not distinctive at some periods in the language’s history (Labrune 2012: ch.4). Even in the modern language, voicing can be a rather unstable feature, in the sense that many non-distinctive alternations between a voiceless consonant and a voiced one occur (as in *kurai~gurai ‘about’*), or that voicing may bring a pejorative connotation (*ton-ton ‘a light rhythmic sound’* vs. *don-don ‘a heavy rhythmic sound’, *sama ‘look, appearance’* vs. *zama ‘look, appearance (pejorative)*’).

Korean tense consonants, which are one of the two main exponents of sai-sios, are also rare word initially, are known to have developed in a secondary manner, and were originally not distinctive (Lee Ki-mun 1972: 124, 197, 207; Huh 1985: 397). Like Japanese voiced obstruents, they are also rather unstable. There are many non-distinctive alternations between a plain and a tense consonant, sometimes with a difference in expressivity or emphasis, for instance /kamakwi~/*k’amakwi ‘crow’, or /cokɨm/ ‘a little’ vs. /c’okɨm/ ‘a very very little’ (Labrune 1997, 1999).

In Basque, a similar distributional pattern is found. An alternative approach to the consonant system of Basque, initially due to Martinet (1955/2005) and later refined by Michelen (1977), views the consonant system as structured along a lenis (or soft, short) and fortis (or strong, long) opposition, as in (26).
This analysis is meant to describe the system of Old Basque, but it is still largely operational for the modern language too. What is interesting is that the opposition between lenis and fortis consonants by and large corresponds to the opposition encountered in lotura-induced consonant alternation. That is, under lotura, the lenis consonants /b d z s g/ become the fortis /*p t tz ts k/ (*/p/ was lacking in Archaic Basque, but it can be structurally recognized as the fortis version of /b/).

Moreover, the fortis consonants /t tz ts k N L r/ were absent, or at least extremely rare, word-initially in Old Basque. The lenis/fortis opposition was relevant only word medially, with the following distribution (Martinet 1955/2005: 241,243):

\[
\begin{array}{ccc}
\text{Initial} & \text{Medial} & \text{Final} \\
\text{lenis only (except } r) & \text{lenis/fortis opposition} & \text{fortis only}
\end{array}
\]

In the modern language, as in Japanese and in Korean, the opposition is still rather unstable and non-distinctive alternations between a fortis and a lenis consonant are easy to find, as in /biper/~/piper/ ‘pepper’ and /gatu/~/katu/ ‘cat’.

The question that thus arises at the structural level is why such a pattern should occur and how we can account for it in all three languages. Another question is whether FLE exponents in other languages exhibit the same type of pattern and the same type of properties in their systems. We shall see below that at least one other language, Slave, does. I leave these issues to future research, but the fact that FLE exponents are likely to be phonemes which normally do not occur at the beginning of native words and/or which developed in a secondary manner definitely constitutes an issue worth further investigation.

11.6 Other Languages with FLEs

This section presents and discusses a number of languages which might be FLE languages. The data are based on second-hand materials, which generally occupy only a few lines in academic papers or books. Furthermore, the data were generally not analyzed from the perspective of FLEs by the original authors. The facts considered in this section are thus tentative, piecemeal considerations, which obviously require more detailed examination in order to be fully validated as instances of FLEs. They are intended to serve the purpose of stimulating future research and discussion on poorly studied languages with respect to word-formation characteristics in general and FLEs in particular.
11.6.1 Slave

Slave is a polysynthetic language spoken in the Northwest Territories of Canada, belonging to the Athapaskan family. Slave seems to possess an FLE which can be represented as [+voice]. According to Rice (1989: 189), if the second element of a Slave compound begins with a continuant, this continuant must be voiced. For instance:

(28) a. /fí/ + /xa/ → /fí+gha/ ‘head’ + ‘hair’ → ‘hair’
(gh/ [ghʷ] is the voiced counterpart of /x/ [x]/[h] in the Slave phonological system)

b. /tsá/ + /teh/ → /tsá+dhéh/ ‘beaver’ + ‘skin’ → ‘fur’

The process is subject to the following semantic blocking factor: the voicing does not apply in compounds expressing the semantic relation ‘N2 is made out of N1’. Furthermore, it is worth noting that in Slave a voicing opposition only exists for continuants, which explains why the [voice] feature can only be implemented on continuants. There is no phonemic voiceless/voiced opposition for plosives or affricates. Other interesting features of Slave are that voiced continuants do not occur stem initially in the language (Rice 1989: 65), that initial voicing also occurs word initially to mark possession (so the FLE might be related to an old genitive morpheme), and that, more generally, fricative voicing in Slave appears to be an extremely complex issue (see, e.g., Rice 1989: 650–655, 2009a: 542), which arises in different contexts and under various conditions.

Slave possesses another linking element which consists in the insertion of /h/ when the first noun ends in a vowel. Rice (1989: 195–196, 2009b) provides the examples /ta/+ /lő/ → /ta+h-lő/ (‘water’ + ‘much’ → ‘deep water’) and /ledí/+ /tene/ → /ledí+tene/ → /ledí+h+tene/ (‘tea’ + ‘pot’ → ‘teapot’). She also states that it is optional in some words, as illustrated by the second example. All the examples that she gives involve second members beginning with something other than a continuant, so it could be that /h/-insertion and continuant voicing occur in complementary distribution. Perhaps this laryngeal fricative /h/ could be autosegmentalized as [−voice], [+continuant].

To sum up, Slave has a feature-size linker [+voice] which targets a special subtype of second-element initial, with a possible allomorph /h/. If the phonological conditions are not fulfilled, nothing happens. The appearance of the FLE is constrained by a number of lexical and semantic factors, and it is also described as irregular. As in Japanese, Korean, and Basque, the surface realization of the FLE results in a phoneme which normally does not occur at the beginning of stems.

11.6.2 Movima

According to Haude (2006: 58–60), in Movima, an agglutinative language of Bolivia classified as an isolate, some nominal bases with a final vowel are followed
by the linking nasal /n/ when another element is attached. The occurrence of the nasal depends on the last syllable of the base. It generally occurs after bases ending in /wa/, /kʷa/, /pa/, /da/, /ra/, /di/, /ri/, /kwi/, /i/, /ti/, and /tʃi/. It does not occur after verb bases. Examples are:

(29)  
- /maropa-n-di/ [mac’pandî] ‘papaya seed’
- /tʃo’ri-n-pa/ [tʃo’rimp’a] ‘fingernail’
- /lo’ra-n-kʷa/ [lo’ran’kwa] ‘leaf’

Note that the linking nasal assimilates in place to the following consonant. Although the transcription adopted may suggest that the linking element is a full segment, given the nature and behavior of nasality in languages, it could probably be analyzed as a floating nasal feature attached to the second element of the compound. If this analysis is correct, then this element can be considered an FLE.

There seems to be a morpho-syntactic blocking factor at work, since verb bases do not receive the linking nasal. Haude (2006: 59) adds that the occurrence of the linking nasal is lexically determined in some cases: some bases receive the linking nasal even though it does not occur after other bases with the same ending. In some cases, the same compound can appear both with and without the nasal, for instance /tobetkʷa-’tik/~/tobetkʷa-n-’tik/ ‘to produce peel’. In other words, the insertion of the linking nasal is lexically determined and at the same time highly irregular and unpredictable.

11.6.3 Kanamari

Silva et al. (1989) and Ishy de Magalhães (2013) describe the existence of an h-element, in Kanamari (Brazil, Katukina family), which consists in the insertion of aspiration at the juncture of the two elements in a compound in certain contexts. 12

(30)  
- [hɔŋ] + [tɔŋ] → [hɔŋʰtɔŋ] ‘terra’ + ‘em cima’ → ‘chão’
- [dɔn] + [dak] → [dɔŋ’dak] ‘peixe’ + ‘casca’ → ‘escama de peixe’
- [wai] + [tsẽkɔ] → [wahtsẽkɔ] ‘caba, marimbondo’ + ‘morrer’ → ‘a caba morreu’

Ishy de Magalhães explicitly analyses the insertion of /h/ as the realization of a linking morpheme similar to rendaku, except that she considers the /h/ to be inserted at the end of the first element, not at the beginning of the second.

The insertion appears as highly irregular, or as optional in some examples. It is also determined by several factors, among which the phonological one is that it is not inserted when the second member starts with /k/, /h/ or a glottal stop.

12. I am grateful to Andrew Nevins for bringing my attention to the Kanamari data and sending me the paper by Priscila Hanako Ishy de Magalhães.

All rights reserved
When /h/ is inserted after the velar nasal, which according to Ishy de Magalhães is its only possible context, the nasal is realized as aspirated [ŋʰ]. Thus, it is not unreasonable to consider that the linking element of Kanamari is an FLE consisting of the feature [+aspiration].

11.6.4 Malagasy

Malagasy (Madagascar, Austronesian) exhibits a system of consonant alternation affecting the initial consonant of the second element in compounds, whereby fricatives and liquids become stops. Roughly speaking, a [+continuant] segment turns into a [−continuant] one, as shown in (31). The data presented in this section are mainly based on Keenan and Polinsky (1998), with some adaptations.

(31) voiceless segments: f → p, s → ts, h → k
voiced segments: v → b, l → d, z → j[ð], r → dr[ʐ]

In addition, a few vowel-initial second elements prefix a /k/.

The alternation (always?) arises following the loss of a syllable at the end of the first element. When the deleted syllable contains a nasal consonant, the alternation in (31) occurs, and the resulting consonant is replaced by its nasalized counterpart. This process applies in reduplications, genitive compounds, verb or adjective+noun compounds (what Keenan and Polinsky 1998 call “Generalized Incorporation”), and after the prefix aN-. In genitive formations, a nasal is sometimes inserted. Representative examples are given below (accent omitted).

(32) a. /velona/ + /velona/ → /velon+mbelona/ ‘alive’ + ‘alive’ → ‘quite alive’
b. /varotra/ + /varotra/ → /varo+barotra/ ‘selling’ + ‘selling’ → ‘petty trade’
c. /adana/ + /adana/ → /adan+kadana/ ‘slow’ + ‘slow’ → ‘very slow’
d. /fantatra/ + /fantatra/ → /fanta+pantatra/ ‘known’ + ‘known’ → ‘known a little’
e. /resaka/ + /resaka/ → /resa+dresaka/ ‘conversation’ + ‘conversation’ → ‘small talk conversation’
f. /orona/ + /saka/ → /oron+tsaka/ ‘nose’ + ‘cat’ → ‘a cat’s nose’
g. /soroka/ + /zaza/ → /soro+jaza/ ‘shoulder’ + ‘child’ → ‘a child’s shoulder’

Silva et al. also consider examples like (30c), where the first element ends in a vowel or a semi-vowel, as relevant to the process of /h/-insertion.
Chapter 11. Rendaku in cross-linguistic perspective

225

h. /trano/ + /andriana/ → /trano+nandriana/
   ‘house’ + ‘noble’ → ‘a noble’s house’

i. /paiso/ + /vazaha/ → /paiso+mbazaha/
   ‘peach’ + ‘foreigner’ → ‘plum’

j. /mangataka/ + /zavatra/ → /mangata+javatra/
   ‘asks for’ + ‘thing’ → ‘asks for things’

k. /satroka/ + /fotsi/ → /satroka+fotsi/ or /satro+potsi/
   ‘hat’ + ‘white’ → ‘white hat’

The alternation is conditioned by various complex prosodic, segmental, morphological, syntactic and lexical factors. In some cases, it may be optional, as in (32k).

At first sight, the Malagasy situation may appear to be rather dissimilar to that of Japanese or Korean, while reminiscent of that of Basque because final deletion at the end of the first constituent occurs. Since the Malagasy alternation always co-occurs with deletion at the end of the first element, the fact that the initial consonant of the second element becomes [−continuant] could be interpreted as a trace of this deletion or, more precisely, in most cases, as preservation of the non-continuant property of the deleted element. This is actually the analysis that Keenan and Polinsky (1998) explicitly adopt. Likewise, prenasalization, when it occurs, can be regarded as preservation of the [nasal] feature belonging to the deleted syllable, but note that prenasalization can also occur when no nasal has been deleted, as in (32i). However, the fact that the Malagasy alternations are very closely governed by a wide range of factors calls for a morphological analysis of the phenomenon. In other words, the deletion of material at the end of the first element of the compound and the alteration at the beginning of the second element can be interpreted as the exponent of a morphological operation involving a linking element, in the same way as rendaku, sai-sios, or lotura.

11.6.5 Nivkh

Nivkh, a synthetic language which has been classified either as an isolate or as a Paleo-Siberian language, has been known for its so-called rich “consonant mutations,” a series of alternations whereby obstruents change their value for continuancy when they are placed in certain phonological and morpho-syntactic contexts (Shiraishi 2000, 2006).

I shall focus here on the alternation process which turns a plosive into a spirant, since Shiraishi (2000) convincingly argues that Nivkh consonant alternation consists only of spirantization, and that other surface alternations are an artefact of the grammar. The alternation which interests us involves the following changes.

\[
\begin{align*}
\text{non-aspirated plosives (lenis):} & \quad p > v, \quad t > r, \quad c[tʃ] > z, \quad k > ɣ, \quad q > χ \\
\text{aspirated plosives (fortis):} & \quad p^h > f, \quad t^h > r̥, \quad c^h[tʃ^h] > s, \quad k^h > x, \quad q^h > χ
\end{align*}
\]
These changes occur in noun+noun and noun+verb compounds, after a first element ending in a vowel, a glide, or a plosive. They do not occur with first elements ending in nasals or fricatives. Note that the alternation also arises in reduplications, as in (34d) below. The examples in (34) are taken from Shiraishi (2006).

(34) a. /pʰeq/ + /cus/ → /pʰeq+zus/ ‘chicken’ + ‘meat’ → ‘chicken meat’ (p. 6)
b. /cʰo/ + /tʰom/ → /cʰo+ɾom/ ‘fish’ + ‘fat’ → ‘fish fat’ (p. 58)
c. /cʰo/ + /kʰerqo/ → /cʰo+xerqo-/ ‘fish’ + ‘catch’ → ‘catch fish’ (p. 83)
d. /pulk/ + /pulk/ → /pulk+vulk-u-/ ‘round’ + ‘round’ → ‘very round’ (p. 92)

Interestingly, as Shiraishi (2006:66) observes, the alternation does not apply to recent borrowings.

Due to the fact that the alternation is subject to phonological, morphological, lexical, and syntactic conditions, these data lend themselves to an interpretation whereby the process can be seen as resulting from the insertion of an FLE corresponding to a [+continuant] feature.

11.6.6 Nêlêmwa

In Nêlêmwa, an Austronesian Kanak language of New Caledonia, some nouns undergo nasalization of their final vowel when they occur as the first element of a determinative compound (Bril 2004). This nasalization sometimes co-occurs with vocalic lengthening and/or apocope of the final consonant of the first element, as in (35).

(35) a. /pwat/ + /jam/ → /pwã+jam/ ‘fruit’ + ‘candlenut tree’ → ‘candlenut tree nut’
b. /cĩ+t/ + /idaama-t/ → /cĩ+idaama-t/ ‘skin’ + ‘eye’ → ‘eyelid’

Under an FLE approach, these data can be interpreted as resulting from the insertion of a [+nasal] linking element.

11.6.7 Malayalam

Finally, we have the case of Malayalam, an agglutinative language belonging to the Dravidian family. This language possesses a linking element exhibiting formal similarity with some of the Korean data considered above. The linking element realizes itself through gemination of one of the consonants at the boundary between the two elements. Stem-final and stem-initial gemination of obstruents in Dravidian stems occurs in compounds with a modifier–modified structure (Fabb 1998). This process can be represented as the insertion of a timing slot (a defective root node, a skeletal slot, a moraic position, etc., depending on the theoretical model). A (default?) vowel /ə/ is sometimes inserted. The examples in (36) are taken from Mohanan (1981:141).
(36) a. /kuṭṭa/ + /kuṭṭi/ → /kuṭṭa+kkuṭṭi/ ‘horse’ + ‘child’ → ‘foal’
   b. /kaaṭ/ + /maṛam/ → /kaaṭṭa+maṛam/ ‘forest’ + ‘tree’ → ‘forest tree’

Fabb (1998: 67) further mentions that Malayalam coordinate compounds are not affected by these gemination processes. This suggests that, once again, we are dealing with a morphological operation rather than a strictly phonological one.

11.7 Synthesis: The essence and attributes of FLEs

The preceding pages have made the case that a subtype of linking elements, the FLEs, must be recognized alongside segmental linking elements and suprasegmental (tonal or accentual) ones, and that rendaku is an FLE. FLEs arguably represent an intermediate stage between fully segmental linking elements and prosodic ones. Like segmental linking elements, FLEs have segmental exponence, but, like prosodic ones, they are underlyingly dependent on a host and lack autonomy. All three types of linking elements exhibit a number of similarities in their morphological behavior, in their functions, in the type of processes that they trigger, and in their conditions of application (favoring and blocking factors). They differ in their exact phonological nature.

The remainder of this section reviews the prototypical formal properties of the FLEs by way of the checklist in (37). This may be used to determine whether a morphological element or compounding process resorts to an FLE or not. The list in (37) has as the aim of laying the foundation for better recognition and identification of FLEs, in order to promote future study of the issue and to achieve a more precise and more explicit characterization of FLEs and their relationship with other linking elements and word compounding devices. Note that some of these properties are also found in segmental and tonal linking elements (like the German *Fugenlaut* and the Etsako associative high tone). This comes as no surprise since, as argued in this paper, FLEs are essentially morphological objects, albeit ones whose surface realization is heavily dependent on the phonological nature of their host.

(37) Properties of FLEs
   a. LOCATION: The marker is implemented at the boundary between two constituents of a compound. (This is also a defining property of the other types of linking elements considered above in §11.2.)
   b. SIZE AND PHONOLOGICAL NATURE: The marker is inferior to a full phoneme in size in its underlying representation. It is inherently incomplete, consisting of one (or sometimes more than one) feature, or of a prosodic position. It behaves like an autosegment.
c. LICENSOR: Because of its incompleteness, the marker needs a phonological licensor to be realized. The phonological host or licensor can be a full segment or, in some cases, an empty structural position (like an empty syllable onset).

d. CONDITIONS OF REALIZATION: The surface realization of the FLE obeys a “no host, no marker” condition, that is, in the absence of a proper licensor, the marker fails to be realized. This occurs, for instance, in Japanese: when the second element begins with a consonant that cannot be voiced (either because it is already voiced or because it has no voiced counterpart in the system), the rendaku marker cannot be expressed at the surface level. (This also happens with suprasegmental linking elements. For example, if the association of a high tone to the initial syllable of the second element of a compound is the exponent of a linking element, this linking element receives no exponent if the syllable in question is already high).

e. PREDICTABILITY OF SURFACE FORM: FLEs may receive different surface realizations (as in Korean or Basque) depending on their host/licensor, but the crucial point is that the final surface realization is always predictable from the host. In contrast, what is not predictable is whether the marker will be inserted or not; see (37h) below.

f. CONVERGENCE: The result of FLE insertion resembles the result of the application of certain post-lexical rules or constraints found in the language. A consequence of this is a certain amount of surface opacity, because it is not always clear whether or not a consonant alternation occurring at the boundary between the two elements of a compound is an instance of an FLE or not. For example, in Japanese, it is sometimes impossible to decide whether we are dealing with rendaku or post-nasal voicing; in Korean, with sai-sios or POT; in Basque, with lotura or post-sonorant affrication, post-fricative devoicing, or consonant fusion. Moreover, and quite interestingly, in Japanese, Korean, Basque, and a number of other languages which have been mentioned as possible FLE possessors, linguists often insist on the fact that the phonological feature(s) and/or segment(s) that are the exponents of the FLE constitute, in some way or other, a complex issue in the phonology of the language, even outside of the FLE phenomena. This probably hints at the fact that the FLE developed out of the morphologization of phonological processes. This is an issue which requires further attention in the future.

g. MULTI-DIMENSIONALITY: FLE occurrence is very strongly constrained by a variety of morphological, phonological (prosodic and segmental), lexical, etymological, semantic, syntactic, and sociolinguistic factors, which interact with each other in a highly complex manner. FLEs are thus multidimensional elements. This is characteristic of linking elements in general.
h. INHERENT VARIABILITY: FLEs appear as fundamentally inconsistent, irregular, and variable. This apparently inconsistent character seems to constitute a rather common property of linking elements (see, e.g., Kürschner and Sczcepaniak 2013c; Ralli 2008), but it is particularly conspicuous in the case of FLEs. It is explicable by their conditions of realization (37d), that is, FLEs are morphological elements whose realization is heavily dependent on phonology and largely determined by the phonological nature of the host. It is also an indirect consequence of the convergence phenomenon. On the one hand, the marker cannot be realized in a great number of phonological contexts due to the phonological conditions that constrain its implementation (37d), while on the other, an FLE often looks like it is present even when it is not, due to the convergence phenomenon (37f). These two facts are arguably instrumental in allowing a large variability space. (See Labrune 2014a for a development of this idea.)

The above eight properties are, I assume, characteristic of FLEs cross-linguistically, and can be viewed as signalling their existence in a given language, thus helping us identify them in a more principled way. A number of new research questions which arise with regard to the nature and categorization of FLEs are the following.

- Where are FLEs anchored at the underlying level? At the beginning of the second constituent? At the end of the first one? Between the two? At different locations depending on languages and/or specific structural conditions?
- What kind of phonological alternations are involved in FLEs? How can these alternations be characterized phonologically? What type of features are involved? Presumably, only features which are easily autosegmentalized are likely to serve as an FLE. The best candidates seem to be laryngeal features (voicing, tensing, aspiration), manner features (nasal, continuant), and empty (or incomplete) prosodic positions such as a skeletal slot, a moraic position, or an empty CV (depending on the phonological framework one adopts). This expectation seems to be confirmed by the examples considered so far. Place features do not seem to be involved in FLEs, at least not in any of the examples reviewed.
- What is the significance of the phonotactic issue, that is, the fact that in at least four of the languages reviewed in this study, the FLE exponents consist of segments that normally do not occur at the beginning of independent words?

What makes a feature easily autosegmentalizable is another research question that we shall leave open.
This can hardly be a coincidence, and it calls for a principled explanation. The key to this phonotactic puzzle also lies in the subject of morphologization, which is itself related to the convergence phenomenon as defined in (37f). Moreover, it seems that in order to account for the FLE facts of Japanese, Korean, and Basque (and probably of other languages) in a comprehensive manner, we should use more structurally oriented categorizations of segments like fortis/lenis, strong/weak, marked/unmarked, as opposed to phonetically motivated ones such as voiced, unvoiced, glottalized, fricative, affricate, etc. This calls for a rehabilitation of structural approaches.

- What kind of parameters trigger or, conversely, block the occurrence of FLEs in different languages? How do the different parameters involved in FLEs interact with each other? How are they interrelated?

- In all the languages I have considered, there exist “immune words,” generally labeled as “exceptions,” that is, words which do not allow the insertion of an FLE even though they fulfill the phonological, morphological, semantic, or lexical conditions for it. In other words, what is recurrent in FLEs is that there seems to be some sort of “patterned exceptionality” in the sense of Zuraw (2000). What is the linguistic status of such exceptions? How should they be marked in the lexicon?

- What are the sources of FLEs in the various languages in which they appear?

- What is the relationship between fully segmental linking elements as found in, for example, German or Russian, FLEs in the strict sense of the term, and tonal and accentual linking elements? What properties do they have in common, and in which respects are they different? What does all this tell us about morphology and phonology?

- What is the relationship of linking elements (be they featural, segmental, or tonal) with the other word compounding processes?

This list of questions is, of course, not exhaustive.

11.8 Have we learned anything about Japanese?

This is the question that can be asked as a conclusion to this paper. The answer is yes. We can now cast a new eye on some of the Japanese facts related to the rendaku phenomenon, and reevaluate some of its dimensions. We also are in a position to better estimate those properties that are induced by rendaku itself and to distinguish them from other properties that are only epiphenomenal to rendaku. In this final section, I would like to review a number of issues specific to rendaku which have arguably received fresh insights thanks to this cross-linguistic investigation.
First, it should be pointed out that the fact that the exponence of rendaku consists of the feature [+voice] is not, in itself, relevant to the typological characterization of rendaku as a linguistic phenomenon, although the fact that [+voice] is a laryngeal feature probably is (see §11.7). Rendaku is often defined as the voicing of the initial consonant of the second element. Although this is, of course, perfectly correct, another way of putting it that would lend itself more readily to cross-linguistic comparison would be to say that rendaku involves a consonant alternation based on the modification of a laryngeal feature, thus allowing us to better capture the link between Japanese rendaku, Korean sai-sios, Basque lotura, and the various other languages that make use of a laryngeal FLE.

Furthermore, if we consider the various Japanese word-formation processes from the broader point of view of FLEs as defined in this paper, we should acknowledge the fact that the language possesses a number of other FLEs besides rendaku. Interestingly, gemination of the initial consonant of the second element of a compound also exists in Japanese (Vance and Asai: §8.4.1), for instance in aki+ppara ‘empty belly’, de+ppa ‘protruding teeth’, and this sometimes alternates with rendaku (de+ba), a device which is easily comparable to some of the realizations of the Korean sai-sios or of the Malayalam linking device. Likewise, the nasalization of the initial /g/ of the second element, as in niwa+[ŋ]eta ‘garden clogs/geta’ (cf. geta ‘clogs’) appears as a separate Japanese FLE distinct from rendaku sensu stricto. Finally, the marginal and largely fossilized process of /s/ insertion, as in haru+same ‘spring rain’ (cf. ame ‘rain’), mas+sao ‘completely blue/white’ (cf. ao ‘blue’), etc., must also be taken into consideration, since it occurs before vowel-initial second elements and is thus reminiscent of Korean and Basque /t/-insertion. Although these other types of Japanese linking elements have received a far more limited amount of interest in comparison to rendaku (but see Takayama 1995 for a comprehensive study), what we have seen in other languages suggests that a more comprehensive and global approach could probably shed new light on these various morphological devices.

As regards the possible origin of rendaku as reflecting the presence of a former genitive particle (Vance 2015a: 399–402), we saw that a similar etymological hypothesis has been put forth for Korean. On the other hand, we also saw that no such similar source can be assumed for Basque. It is thus necessary to gather more information on FLE genesis in various languages in order to check whether an FLE can be traced back to a former genitive mark or not, and, more generally, whether FLEs result from a full segmental element or not (be it a genitive or something else). While, of course, the responses to these questions about Japanese rendaku must be primarily found within Japanese, it does no harm to consider the Japanese facts from a more general standpoint. In this respect, recall that segmental linking elements like the German Fugenlaut markers (-s, -en, -e, etc.) are known to
be etymologically related to the genitive case marker, whereas no such origin has been proposed for suprasegmental linking elements like the associative high tone of Etsako or similar devices.

Another interesting issue concerns the status of Lyman’s Law. Here too, the comparison with other languages can offer a novel outlook on the Japanese facts. Even if some recent studies have uncovered a slight tendency to avoid sai-sios insertion in Korean when a tense consonant is already present, this remains a tendency, and its coverage and strength is in no way similar to that of Lyman’s Law. Although Lyman’s Law has often been presented as the key phenomenon of the rendaku machinery, it is probably best to simply consider it as an instance of a more general, and well-known, phonotactic principle of Japanese which applies (or rather, applied, since this principle used to operate only in Yamato words) wholesale to the Japanese lexicon. This principle holds that no word should contain two voiced obstruents. In other words, the avoidance of two voiced obstruents in the second element of a compound is orthogonal to rendaku itself. This takes us back to the “phonotactic issue.”

An interesting and promising new research question concerns the specificity of Sino-Japanese words, in light of the difference which has been uncovered between Sino-Japanese and Sino-Korean compounds with respect to rendaku and sai-sios application. Although one could have expected more or less similar behavior between these two word classes in Japanese and Korean, it is interesting to observe that they exhibit clearly different behavior with respect to FLE insertion (see §11.4). Korean sai-sios favors the juncture between two Sino-Korean sinographs (two-sinograph lexemes), while Japanese rendaku is extremely rare in the same context, favoring rather the juncture between two Sino-Japanese two-sinograph lexemes (i.e., four-sinograph lexemes).

An old but still ongoing debate is whether rendaku should be understood as a lenition or a fortition process. Here we find two opposite approaches. Vance (2015b) seems to consider that rendaku is basically a type of lenition, and it is indeed fair to say that the voicing of a voiceless consonant between two voiced segments should be considered as such from a general phonetic point of view. I Munsang (2004) also maintains that rendaku boils down to lenition, while gemination (sokuon-ka) would be, in contrast, fortition. On the other hand, Rosen (2003) implicitly assumes that rendaku is fortition, which occurs in order to give prominence to a consonant which is at the left edge of a prosodic word. The Korean and Basque facts lead us to reconsider this issue, and to rather interpret rendaku as fortition, because in both languages, there is absolutely no doubt that the exponents of FLE insertion are to be considered as fortis consonants.

Another way to consider this problem is to ask whether rendaku-induced voicing should be regarded as marked or unmarked. Here, the comparison with
other languages definitely brings fresh new material and perspective. This relates to what we have termed “the phonotactic issue” in the preceding pages. The cross-linguistic perspective provides grist for the mill of linguists who have argued that the fact that rendaku involves consonants which do not normally occur at the beginning of independent words must be taken as significant structurally. It is striking to observe that the same pattern occurs in Korean, in Basque, and in Slave, since in these three languages the exponent of the FLE also consists of a segment which is normally not allowed word initially and which is thus considered marked.

Another related question is whether one should recognize a teleological dimension to rendaku insertion, that is, should rendaku be analyzed as a process whose very purpose is to obtain fortition? Here too, the answer seems to be positive, because of the phonotactic issue. But on the other hand, fortition can also be seen as a side effect of rendaku insertion, because the convergence phenomenon suggests that FLEs may result from the morphologization of assimilatory processes, that is, from lenition. There is thus an apparent contradiction in the nature of rendaku and other FLEs. In the case of rendaku, for instance, the insertion of the [+voice] morphological element creates a segment normally not allowed word-initially, a marked fortis segment. On the other hand, at the same time, rendaku is sometimes indistinguishable from post-nasal voicing, an assimilatory process and thus a lenition phenomenon (cf. convergence).

Acknowledgements

An earlier version of this paper was presented at the 3rd International Conference on Phonetics and Phonology, held at the National Institute for Japanese Language and Linguistics, Tokyo, in 2013. I wish to thank Tim Vance for offering me the chance to participate in the rendaku research project, which led me to take up again and broaden my knowledge about a fascinating and understudied research topic that I had worked on several years previously. I am also very grateful to Mark Irwin and Tomoaki Takayama for very helpful discussions and suggestions. Finally, I wish to thank Michel Aurnague, Injoo Choi-Jonin, Priscila Hanako Ishy de Magalhães, Mi-young Kang, Voahirana Piquemal, and Iñaki Rezola for help with the Basque, Kanamari, Korean, and Malagasy data.